

SELECTIVELY COLD WORKED HYDRAULIC MOTOR/PUMP SHOE

ABSTRACT OF THE DISCLOSURE

A method of manufacturing a wear resistant shoe (26) includes upsetting (46) one end portion (38) of cylindrical member to work harden that portion to a substantial depth, machining (48) the cylindrical member portion to finished dimensions and surface hardening (56) a face (28 or 34) of the machined cylindrical member portion. The cylindrical member may comprise rod stock of a diameter less than the greatest diameter of the finished shoe and be upset or swaged to axially reduce and radially increase the dimensions of the one end portion. A hollow region (30) is formed in an opposite rod stock end portion and the periphery (50) of the hollow region is crimped about a rounded end (18) of the piston (20). The cold work done during the swaging or forming process provides a foundation for hardened faces comprising balance (28) and auxiliary balance (34) lands, forms a crude shape of the shoe, and imparts work hardening and wear property improvements. The harder metal surface provides a foundation for subsequent surface hardening such as coating with TiN. The crimping process used to join the shoe to the piston imparts cold work to the skirt region of the shoe and enhances the wear resistance of the shoe. The cold heading step (46) may be omitted if a hardened rod stock is used, but the skirt should be annealed (66) prior to crimping to the piston.